

REMARKS

Claims 1-18 and 38-39 have been rejected by the Examiner. Such rejections are fully traversed below. Claims 1-3, 5, 7, 8, and 12-15 have been amended. No new matter has been added. Claims 38-39 are cancelled without prejudice to further prosecution. Claims 1-18 are thus pending in this Application.

Rejections Under 35 U.S.C. § 112, second paragraph

Claims 1-18 and 38-39 were rejected to under 35 U.S.C. 112, second paragraph, as being indefinite and for failing to particularly point out and distinctly claim the invention.

With respect to claims 7 and 13-15, the claims have been amended to further clarify the subject matter regarded as the invention in accordance with the Examiner's comments.

As for claim 1, Applicants respectfully submit that one of skill in the art is aware of process chemistry used in a semiconductor fabrication apparatus and note that it is not necessary for claim 1 to recite specific details that would be apparent to one of skill in the art, particularly when process chemistry usage for a semiconductor fabrication apparatus is a well known practice. The Examiner states the scope of claim 1 would change when the process gas chemistry was changed. Applicants respectfully disagree. The scope of claim 1 is independent of the process chemistry used in the semiconductor fabrication apparatus and is not limited by any particular chemistry. Similar logic applies to claim 8. Thus, Applicants respectfully submit that claims 1 and 8 are not vague and indefinite to one of skill in the art and that amendments to resolve any indefiniteness are not necessary.

With respect to claim 5, the claim has been amended in accordance with the Examiner's comments.

As for claim 8, the claim has been amended to remove any indefiniteness.

As for claim 38, the claim has been cancelled.

With respect to claims 1, 5, 6, 12, and 15, the language "over the operating life of the gas distribution plate" has been removed from the claims.

With respect to claim 1, the language "substantially non-reactive" has been removed from the claim.

With respect to the meaning of “micro-defects about 50 micrometers” in claim 39, the term is supported by the Specification, for example, on page 6, lines 1 to 20, and page 3, line 18-24.

Accordingly, Applicants respectfully submit that all pending claims are sufficiently clear and definite and thus respectfully request withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

Rejections Under 35 U.S.C. § 102(b)103(a)

Claims 1-18 and 38-39 stand rejected under 35 U.S.C. §102(b) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Maydan et al., U.S. Patent No. 5,746,875 (“Maydan”). Applicants respectfully traverse.

Claims 1-6, 8, 12-16 and 38-39 stand rejected under 35 U.S.C. §102(e) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Shang et al., U.S. Patent No. 6,182,603 B1 (“Shang”). Applicants respectfully traverse.

Claims 1-18 and 38-39 stand rejected under 35 U.S.C. §102(e) as being unpatentable, or in the alternative, under 35 U.S.C. §103(a), as obvious, over Wicker I et al., U.S. Patent No. 5,993,584 (“Wicker I”). Applicants respectfully traverse.

Independent claims 1 and 12 have been amended to recite “wherein the portion of the gas distribution plate has substantially no micro-defects about 50 micrometers or greater, after machining, that may lead to contamination of a wafer located within said semiconductor processing chamber”. A specific example of eliminating micro-defects in accordance with the present invention and support for this amendment is included in the Specification on page 6, line 1 to page 7, line 17, and page 10, lines 4-12, for example. It is respectfully submitted that no combination of the prior art suggests such a limitation in the context of the claimed invention.

Dependent claims 2-11, and 13-18 each depend either directly or indirectly from independent claims 1 and 12 and, therefore, are respectfully submitted to be patentable over Maydan, Shang and Wicker I, or any combination thereof, for at least the same reasons set forth above with respect to the independent claims. Further, the dependent claims require additional elements that when considered in context of the

claimed inventions further patentably distinguish the inventions from the art of record.

By way of example, dependent claim 8 recites "wherein the gas distribution plate includes a material whose products from reacting with the process chemistry used in the semiconductor fabrication apparatus are gaseous". Applicants respectfully submit that the art of record does not teach this limitation.

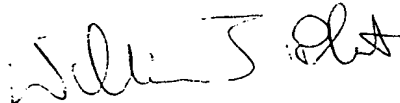
Alternately, dependent claim 16 recites wherein said gas distribution plate is pretreated by heating at a controlled temperature for a prolonged time, after machining". Applicants respectfully submit that the art of record does not teach this limitation.

Withdrawal of the rejections of claims 1-18 based on 35 U.S.C. § 102(b), 102(e) and 103(a) are therefore respectfully requested.

In view of the foregoing, Applicants believe that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

No fees are believed due in connection with the filing of this paper. However, if any fees are due in connection with the filing of this paper the Commissioner is authorized to charge such fees to Deposit Account 50-0388 (Order No. LAM1P118).

Respectfully submitted,
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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

1. (Twice Amended) A gas distribution plate for use in a semiconductor fabrication apparatus including a semiconductor processing chamber, the gas distribution plate comprising:

a plurality of holes for passing process gases to the semiconductor processing chamber; and

a portion [being substantially non-reactive] exposed to the process chemistry used in the semiconductor fabrication apparatus [over the entire operating life of the gas distribution plate], wherein the portion of the gas distribution plate has substantially no micro-defects about 50 micrometers or greater, after machining, that may lead to contamination of a wafer located within said semiconductor processing chamber.

2. (Twice Amended) A gas distribution plate as recited in claim 1 wherein the [portion of the gas distribution plate is rendered substantially non-reactive by reducing surface defects on the portion] micro-defects are substantially eliminated before implementation within the semiconductor fabrication apparatus.

3. (Once Amended) A gas distribution plate as recited in claim 1 wherein the [portion of the gas distribution plate is rendered substantially non-reactive] micro-defects are substantially eliminated by heating the portion.

5. (Twice Amended) A gas distribution plate as recited in claim 1 wherein, during its operation, the gas distribution plate produces less than 0.1 [defect] particle[s] defects per square centimeter for a wafer processed in the semiconductor fabrication apparatus over the entire operating life of the gas distribution plate.

7. (Once Amended) A gas distribution plate as recited in claim 6 further comprising at least one distribution channel, wherein the at least one distribution channel [groove] is machined to a back face of the gas distribution plate.

8. (Once Amended) The gas distribution plate as recited in claim 1 wherein the gas distribution plate includes a material whose products from reacting with the process

chemistry used in the [plasma processing chamber] semiconductor fabrication apparatus are gaseous.

12. (Once Amended) A plasma-based fabrication apparatus, comprising:
a plasma chamber that receives process gases and forms a plasma therefrom;
and
a gas distribution plate including a plurality of holes that supply the process gases into said plasma chamber, a portion of said gas distribution plate being [substantially non-reactive with] exposed to the process chemistry used in said plasma chamber [over the entire operating life of said gas distribution plate], wherein the portion of the gas distribution plate has substantially no micro-defects about 50 micrometers or greater, after machining, that may lead to contamination of a wafer located within said semiconductor processing chamber.
13. (Once Amended) A plasma-based fabrication apparatus as recited in claim [11]12 wherein said plasma-based fabrication apparatus fabricates semiconductor devices.
14. (Once Amended) A plasma-based fabrication apparatus as recited in claim [11]12 wherein said plasma-based fabrication apparatus is a semiconductor etch machine.
15. (Once Amended) A plasma-based fabrication apparatus as recited in claim [11]12 wherein said gas distribution plate is pretreated by heating [so as to be substantially non-reactive with the process chemistry over the entire operating life of said gas distribution plate].
- 38-39. Cancelled.

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APPENDIX OF ALL PENDING CLAIMS

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1. (Twice Amended) A gas distribution plate for use in a semiconductor fabrication apparatus including a semiconductor processing chamber, the gas distribution plate comprising:

a plurality of holes for passing process gases to the semiconductor processing chamber; and

a portion exposed to the process chemistry used in the semiconductor fabrication apparatus, wherein the portion of the gas distribution plate has substantially no micro-defects about 50 micrometers or greater, after machining, that may lead to contamination of a wafer located within said semiconductor processing chamber.

2. (Twice Amended) A gas distribution plate as recited in claim 1 wherein the micro-defects are substantially eliminated before implementation within the semiconductor fabrication apparatus.

3. (Once Amended) A gas distribution plate as recited in claim 1 wherein the micro-defects are substantially eliminated by heating the portion.

4. A gas distribution plate as recited in claim 1 wherein the portion includes at least one surface of the distribution plate which is exposed to the internal regions of the semiconductor processing chamber.

5. (Twice Amended) A gas distribution plate as recited in claim 1 wherein, during its operation, the gas distribution plate produces less than 0.1 particle defects per square centimeter for a wafer processed in the semiconductor fabrication apparatus over the entire operating life of the gas distribution plate.

6. A gas distribution plate as recited in claim 1 wherein the gas distribution plate does not substantially diminish wafer yield over the entire operating life of the gas distribution plate.

7. (Once Amended) A gas distribution plate as recited in claim 6 further comprising at least one distribution channel, wherein the at least one distribution channel is machined to a back face of the gas distribution plate.

8. (Once Amended) The gas distribution plate as recited in claim 1 wherein the gas distribution plate includes a material whose products from reacting with the process chemistry used in the semiconductor fabrication apparatus are gaseous.

9. The gas distribution plate as recited in claim 1 wherein the gas distribution plate includes a ceramic material.
10. A gas distribution plate as recited in claim 9 wherein the plate includes one of Si_3N_4 , Al_2O_3 , AlN and SiC .
11. A gas distribution plate as recited in claim 9 wherein the ceramic material is included in a portion of the gas distribution plate which faces the semiconductor processing chamber.
12. (Once Amended) A plasma-based fabrication apparatus, comprising:
a plasma chamber that receives process gases and forms a plasma therefrom;
and
a gas distribution plate including a plurality of holes that supply the process gases into said plasma chamber, a portion of said gas distribution plate being exposed to the process chemistry used in said plasma chamber, wherein the portion of the gas distribution plate has substantially no micro-defects about 50 micrometers or greater, after machining, that may lead to contamination of a wafer located within said semiconductor processing chamber.
13. (Once Amended) A plasma-based fabrication apparatus as recited in claim 12 wherein said plasma-based fabrication apparatus fabricates semiconductor devices.
14. (Once Amended) A plasma-based fabrication apparatus as recited in claim 12 wherein said plasma-based fabrication apparatus is a semiconductor etch machine.
15. (Once Amended) A plasma-based fabrication apparatus as recited in claim 12 wherein said gas distribution plate is pretreated by heating.
16. A plasma-based fabrication apparatus as recited in claim 15 wherein said heating occurs at a controlled temperature for a prolonged time.
17. A plasma-based fabrication apparatus as recited in claim 16 wherein the controlled temperature is between about 1500 degrees Celsius to 1600 degrees Celsius.
18. A plasma-based fabrication apparatus as recited in claim 15 wherein the prolonged time is from about 5 to 10 hours.
- 38-39. Cancelled.